SOCIO-ECONOMIC FACTORS AND PROFITABILITY OF MUSLIM-OWNED PATIN FISH CAGE OPERATORS: A PRELIMINARY ANALYSIS

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ABSTRACT

This study seeks to investigate the socioeconomic factors that affected the profitability of fish farming among Muslim-owned cage operators that produce patin (catfish) for sale to household consumers. The analysis was based on surveys on 50 fish cage operators from the Pahang river, Temerloh. Majority of them were married with the education level of secondary school. Multiple regression analysis shows that age, educational level, and marital status had positive and non-significant relationships with profitability. Besides that, economic factors such as the number of cages, capital investment, marketing, and labour size had positive and significant relationships with profitability. The findings also show that although marketing was significant to profitability, the significance level was not higher than the number of cages, capital investment, and labour size. This paper is significant because it provides evidence to small businesses, including farmers and their family, that capital investments, the number of cages, marketing, and labour size are crucial for increasing the profitability. The findings are also significant for the fish farmers and government in terms of allocating funds to fish farmers and training labours to increase work opportunities, satisfy consumers' demand, and contribute to the economy.

Keywords: Consumer, farmer, fish farming, profitability, socioeconomic

INTRODUCTION

Many people believe that there is a significant potential for fish farming in the aquaculture industry. Føre et al. (2017) claimed that industrial fisheries are vital in being the supplier of protein with the rising number of demand as a result of the growing household population. Emokaro, Ekunwe, and Achille (2010) suggested that the current level of fish production is considerably low to meet the protein requirement of the consumers' population; therefore, fish farming is required. Adewuyi et al. (2010) found that fish production is economically profitable and rewarding, helps to provide employment, supplementing income, and enhancing the standard of living.

Currently, fish farming in the freshwater aquaculture such as catfish, carp, red tilapia, black tilapia, snakehead, and prawn is claimed to be the fastest developing food production system in the world when it is done in ponds, pens, cement tanks, ex-mining pools, cages, canvas tanks, and other cage systems. Sworder (2018) stated that fish farming via the cage system has evolved over the past three decades and its contribution to the global fish supply has increased from 7% in 1980 to 40% recently. Sworder predicted that 50% of fish consumed in the future would be from caged fish rather than fish caught by fishermen. It is believed that countries in Southeast Asia have potentials to be the main leaders in the aquaculture economies.

In Malaysia, catfish was the leading contributor to aquaculture with about 47.08% from the 73,816 tonnes of catfish production in 2012 (Iliyasu et al., 2016a). However, the numbers changed in the following years. In 2017, the fish farming industry was in third place after the oil palm industry (2.7%) and other agriculture sectors (1.3%) in Malaysia. The sector has contributed 1.1% of Gross Domestic Product (GDP) out of 7.3% that is contributed by the agriculture industry. Fish trading and fish products have been developing rapidly with an average of 5%, where the export and import rates increased by an average of 3% and 8% annually, respectively (Department of Fisheries Malaysia, 2017a).

Realising the promising future and the increase of demand for fish in the world, big production of fish farming is thus recommended. In the present situation, the Food and Agriculture Organisation (FAO, 2010) stated that the supply of freshwater fish from capture fisheries has been declining. In Malaysia, it is reported that the country could only produce 1.9 million metric tonnes of freshwater fish within one year; although it is predicted that by 2020, the household demand would reach 3.5 million metric tonnes of freshwater fishes (Sinar Harian, 2015). Malaysia has yet to fulfil the supply of fish stocks despite the government's initiatives and plans. According to Njeru (2013), global challenges include poor understanding of fish farming technology, insufficiency of capital, and inadequate information on the right species to culture in specific location.

In short, the fish farming study has not been fully explored, especially on matters regarding fish farmers and household consumers. Several problems include the production of catfish such as the lack of management skills, capital insufficiency, faulty data collection, and fish products marketing. In addition, many people who are currently involved in fish farming have a low level of management skill (Adewumi and Olaleye, 2011). There are limited empirical studies done regarding the cost and profit of fisheries and the targeted consumers in Malaysia. This paper is significant for farmers and consumers because the household does not know the real costs in fisheries due to the inadequate marketing procedures combined with the low level of information available which impacted fish farms profitability.

The main objective of this study is to identify the socioeconomic factors that affected the profitability of fish farming among Muslim-owned cage operators that focus on producing patin (catfish) for sale to household consumers. This study has determined whether age, education level, and marital status of fish operators have a significant relationship with profitability. The study also aims to determine whether the number of cages, capital investments, marketing, and labour size have a significant relationship with the profitability of fish farming. The rest of this paper is organised as follows. Section 2 provides the literature review, hypotheses development, and descriptions on variables. The subsequent section is followed by a brief discussion on the research methodology, particularly in Section 3, while Section 4 presents and discusses the results. The final section concludes the study.

THE PROFITABILITY OF FISH FARMING

By definition, profitability in fish farming is the financial gain or profit after deducting expenses from the revenue (Wattanutchariya and Panayotou, 1982). Profitability can vary depending on factors such as demanding output price, lower input income, and the productivity level (Walden & Kitts, 2014). This is challenging because profitability is determined by the difference between total variable cost and gross revenue. A business can be considered making profit if the total variable cost is less than the gross revenue or positive gross margin (Emokaro et al., 2010). In measuring the profit for agriculture, the cost should not only focus on economic factors but also on the social aspects (see Moore et al., 2017) to represent socio-economic factors which are expected to affect the final profit (Tajerin and Noor, 2003). This study considered variables such as age, education, marital status, number of cages, capital investment, marketing, and labour size as the socio-economic factors of the fish operators that are shaping consumers' decisions on the fish they shop.

Social Costs

Age

Polson and Spencer (1991) stated that age has a direct relationship with new farming technology acceptance because younger operators are more open to innovation in fish farming (Maina et al., 2014). According to Iliyasu et al. (2016a), older operators might have invested in a certain production technology which refrains them from adopting new technology. Although older and more experienced operators have greater managerial skills than new operators (Iliyasu et al., 2016b), they are more reluctant to accept new or improved technology adoption.

Nevertheless, many older operators are technically more efficient (see Iliyasu et al., 2016a, Iliyasu et al., 2016b). When dealing with unexpected events such as flood, polluted water, and fish diseases in the fish farming operation, old operators have the vitality and ability to make an effective decision. Njeru (2013) classified the age between 31 and 60 years as the matured age and they are competent to make informed decisions. Hoang and Yabe (2012) discussed the significance of farm characteristics and suggested to keep the size of household small to medium to increase productivity and profitability. Oluwasola and Ige (2015) reported that the age and size of family, particularly medium size, are significant for financial profitability. Shawon, Prodhan, Haque, Khan, and Mitra (2018) found that experienced framers of 23–64 years old have better production practices and financial profitability.

Educational Level

Lai and Yang (2008) stated that internal factors such as lack of knowledge would affect production. Knowledge and understanding in aquaculture are measured based on the understanding related to aquaculture operations such as water and food management. In general, fish operators with more experiences are technically efficient (Samah et al., 2016). Most experienced operators have gained knowledge of fish farming due to regular interactions with different types of issues. A study by Iliyasu et al. (2016a) found that educational level positively impacts technical efficiency. Education enhances the capacity to interpret, perceive, and respond to the latest innovation and increase the operator's potential to use the handy inputs sensibly (Iliyasu et al., 2016b). Operators with

a greater degree of formal education tend to embrace fish farming than those with lesser formal education. This situation happens when most fish farming technologies nowadays are channelled to operators by training and seminar, newsletter, and pamphlet where operators with formal education are the ones who participate in such training and seminar to study, understand, and use the information (Kimenye, 2001). More education leads to technology adoption which increases the framers' income (Alawode et al., 2016).

Marital Status

Previous studies revealed that majority of the operators in the fish farming activities were married with a total of 63.7% (Adewuyi et al., 2010), 77% (Njeru, 2013), 76.1 % (Olaoye et al., 2013), 66% (Ike et al., 2014), 79.16% (Syandri et al., 2015), and 82.5% (Rahman et al., 2016). Ike et al. (2014) found that operators generally need a spouse to raise children to support family labour. Oladoja et al. (2008) and Njeru (2013) claimed that marriage creates responsibilities to operators and causes them to be more serious in terms of their participation in fish farming activities. This statement is similar to Oriaro (2011) that married operators adapt well to fish farming than other categories. In Southeast Asian countries such as Malaysia, more than half of the farms are owned by married men that are operated jointly with their wives and children who often took the role of feeding, processing, and selling the fish after harvesting (Asmah, 2008). The implication is that this figure is expected to enhance the use of more family labour in the fish farming operations that can lead to a decreased number of hired labours in the study area.

Economic Factors

The Number of Cages

Samah et al. (2016) observed that one of the key indicators affecting the technical efficiency of pond culture system is farm size. The study revealed that large farms are technically less efficient than small farms. This issue is due to the management of small farms that is easier in terms of input resources monitoring which differed from larger farms that need more efforts. Nevertheless, this view received mixed responses. Alam (2011) affirmed that pond owners with bigger ponds are likely to have higher allocative and cost-efficiency. A study by Asmah (2008) found that operators with small ponds use more inputs of feed and fingerlings with very low input of hired labour compared to their pond size. These operators are less considerate in applying inputs to the recent live stocks. In contrast, fish operators with larger ponds are more likely aware of the input costs in comparison to owners of smaller ponds.

Capital Investment

The investment cost for catfish farm includes the cost spent on land, construction of pond, water pump, fishing net, and other elements such as machetes, head pans, and spades. A few individuals participated in the fish production due to the high initial cost which affects and discourages fish operators who might lack resources (Emokaro et al., 2010). According to Njeru (2013), most fish operators started their fish farming using their own money while others obtain capital from banks, government support programme, and cooperative societies. Operators who are self-funded eat the harvested fish by themselves and sell the yield at institutions and markets outside of their farms (Maina et al., 2014). Capital source is found to have an insignificant effect on technical efficiency (Samah et al., 2016). According to Asmah (2008), self-financed farms with a small amount of loan usually operate their production wisely either on their own land, leased land, family land, or state land.

Marketing

Marketing is the promotion and selling activity of business products or services. It is the creation of customer value and engagement. Marketing in aquaculture constitutes the marketplace, fish prices, fish species, demand, and supply. According to Adu (2005), most fish operators only focus on production improvement while neglecting the processing, socio-economic factors, aquaculture adoption, and marketing. This practice causes loss to fish operators. The deficiency of markets is one of the troubles faced by most operators for the government fish project. This challenge hinders fish operators from upscaling their venture (Maina et al., 2014). Njeru (2013) found that the marketing of fish has a positive impact on fish profitability. Njagi, Ibuathu, and Guyo (2013) reported that finding places to sell fish through a good road network is an issue for farmers, and it is crucial to increase profitability. In small-scale fish farms, fish operators gained the market among neighbours due to a long duration of staying in the fish venture. Most of the operators sell their fish locally and the fish price is determined by negotiations between sellers and buyers. The costs of marketing for subsistence farms have been exceedingly low because the fish are bought in bulk at the farm's gate (Asmah, 2008).

Labour Size

Cage fisheries commonly operated in rivers. This situation causes the need for supplementary labour (Iliyasu et al., 2016a). Singh (2007) and Kudi, Bako, and Atala (2008) found that the number of hired labour has a positive and significant impact on fish production, which affected profitability. According to Bamire et al. (2008), the increase in labour used by man-days will increase the net income by 12.3%.

In most cases in Southeast Asia, Samah et al. (2016) believed that labour cost constitutes only a small portion of the production cost due to the assistance from family members. Operators who operate at a small scale usually depend on their own family as the workforce and occasionally employ attendants to assist them during fish harvesting or preparation of the farm. Fish operators in most rural regions are poor and rely on manual labour to operate the farm due to the inability to use contemporary machinery (Iliyasu et al, 2016a). Regardless of the labours' status as family members or non-family members, the literature revealed that there is a positive correlation between labour size and potentials to grow and increase profitability (Rosset, 2000; Oluwasola & Ige, 2015).

Descriptions of Hypotheses and Variables

In line with the arguments discussed in the previous sections and based on the existing literature, this study hypothesised the following:

H1 – There is a significant relationship between age, educational level, and marital status with the profitability of fish farming.

H2 – There is a significant relationship between the number of cages, capital investments, marketing, and labour size with the profitability of fish farming.

The OLS regression is written as follows:

$$PFT = b_0 + b_1AG + b_2EDU + b_3MS + b_4NOC + b_5CI + b_5MKG + b_5LS + €$$

Table : A summary of the variables.

Variables and Objectives	Types of Variables	Acronym	Variable Measurements	Predicted sign
Dependent Variable	Profitability	PFT	Profit derived from total cost minus total revenue.	NA
Independent Variables –	Age	AG	The range of the operators' age from 20 years old to 69 years old.	(+)
Sociological Factors	Educational level	EDU	Education level of the fish operators, ranging from primary school, secondary school, Diploma, Degree, and Master.	(+)
	Marital status	MS	Marital status of the fish operators, whether single or married.	(+)
Independent Variables – Economic Factors	The number of cages	NOC	The number of cages owned by the operators in fish breeding.	(+)
	Capital investment	CI	Total and type of investment.	(+)
	Marketing	MKG	Cost and type of marketing to promote the industries.	(+)
	Labour size	LS	The number of labours used in the fish farming activities measured in man-days.	(+)

RESEARCH METHODOLOGY

This study involved 50 *patin* fish operators who operate floating cages tethered along the river bank. The data were collected through a field visit in 2019 to the cages of *patin* fish farms in Pahang River, Temerloh which is well known as 'the home to *ikan patin*' (Zulkifly, 2019). For most Malaysians, "Pahang River is like a confluence of a mix of waters from the Kuala and the Hulu parts which allow the *patin* fishes to thrive with plankton and algae, making them strong and healthy" (Edward, 2015). Pahang River has various species of fish (Rashid et al., 2015), especially *patin* that is unique and profitable to cage fish operators (Mustafa et al., 2018).

Reliability is the extent to which the variables tested produce consistent and stable output (Phelan & Wren, 2005). The questionnaire's internal consistency and reliability were assessed using Cronbach's alpha coefficient (α) for each dimension. The value of each dimension was above 0.60 and close to 0.70. These values are considered satisfactory (Taber, 2018).
Table 2 presents the details of operators based on their socio-demographic data such as age, education level, marital status, number of children, number of partners, and mode of farming.

Table 2: Socio-demographic Data of Muslim-owned Fish Cage Operators

Respondent Profile.	Details	Frequency	Per cent (%)	Mean	Standard Deviation
Gender	Male	44	88.0	1.12	0.328
	Female	6	12.0		
Age	20–29 years old	6	12.0	2.84	1.201
	30–39 years old	17	34.0		
	40–49 years old	11	22.0		
	50–59 years old	11	22.0		
	60–69 years old	5	10.0		
Education Level	Primary School	3	6.0	2.36	0.851
	Secondary School	34	68.0		
	Diploma	6	12.0		
	Degree	6	12.0		
	Master	1	2.0		
Marital Status	Single	11	22.0	1.78	0.418
	Married	39	78.0		
Number of Children	No children	11	22.0	1.54	1.182
	1–2 children	15	30.0		
	3–4 children	13	26.0		
	5–6 children	8	16.0		
	7–8 children	3	6.0		
Number of Partners	No partner	28	56.0	1.12	1.534
	1 partner	5	10.0		
	2 partners	8	16.0		
	3 partners	3	6.0		
	4 partners	4	8.0		
	5 partners	2	4.0		
Mode of Farming	Part-time	13	26.0	0.74	0.443
	Full-time	37	74.0		

Figure 2 shows that most of the respondents were males with 88% while females only constitute a small portion of 12%. This percentage shows that this industry is dominated by males. It can be relatable to the traditions where men are the one who works for the family while women are responsible for house chores. Most of the operators were between 30–39 years old (34%). Operators from the age of 40–49 years old and 50–59 years old were both 22%. Overall, 78% of the operators were categorised into the economically active group of 30–59 years old. About 65.9% of the fish operators had formal education until secondary school. The operators are considered literate because only a small proportion of them had low formal educational level. Only 24.4% of the operators were single and the rest were married. The largest group of operators had 3–4 children (26%), followed by no children (22%). The analysis result indicates that the majority of the fish operators operated their farm by themselves (56%), and most of the respondents operate their farms in full-time mode (74%).

RESULTS AND DISCUSSIONS

Table 3 shows the correlation between profitability and sociological factors. The results show that age had a negative correlation with profitability, whereas educational level and marital status had a positive correlation with profitability. Nevertheless, the results show that all these social factors were not statistically significant to profitability.

Table 3: The Correlation Matric for Sociological Factors

	Profitability	Age	Education Level	Marital Status
Profitability	1			
Age	-0.130	1		
Educational Level	0.246	-0.254	1	
Marital Status	0.080	0.377**	-0.002	1

Notes: ** Correlation is significant at the 0.01 level (2-tailed)

Table 4 shows the correlation between profitability and economic factors. The results show that all factors had a positive relationship with profitability, whereas the number of cages, capital investment, and labour size were statistically significant to profitability at the 0.01 level while marketing was significant at the 0.05 level.

Table 4: The Correlation Matric for Economic Factors

	Profitability Per Year	Number of Cages Owned	Capital Investment	Marketing	Labour Size
Profitability Per Year	1				
Number of Cages Owned	0.411**	1			
Capital Investment	0.463**	0.797**	1		
Marketing	0.285*	0.381**	0.343*	1	
Labour Size	0.478**	0.603**	0.672**	0.305**	1

Notes: ** Correlation is significant at the 0.01 level (2-tailed)
***** Correlation is significant at the 0.05 level (2-tailed)

Table 5 shows the model results and coefficient values. The result was obtained from the multiple regression analysis for age, educational level, marital status, the number of cages, capital investment, marketing, and labour size with the coefficient of determination, R^2 value of 0.317. This result indicates that 31.7% of the variation in profitability can be explained with the variables. This study did not consider 68.3% of the variation in profitability that is determined by other factors. The Durbin-Watson statistic is in the range of 0 to 4. A test for statistic range of 1.50 to 2.50 is relatively normal.

Table 5: Model Result and Coefficient Value

Model	Values
R Square	0.317
Durbin Watson	2.175
F-Value	2.782
P-Value	0.018

The value of Durbin Watson in this study was 2.175 which is within the acceptable range. Thus, it can be deduced that there is a negative autocorrelation. The *p*-value was 0.018, which is less than 0.05, indicating that the study model is significant. Table 6 shows the results of social and economic factors on profitability and provide a summary of the findings based on *t*-value and *p*-value.

Table 6 : The coefficients value of the model

	Coefficient	t-stat	p-value
(Constant)	-	1.252	0.218
Age	-0.183	-1.237	0.223
Educational Level	0.051	0.353	0.726
Marital Status	0.159	1.086	0.284
Number of Cages	0.007	0.032	0.975
Capital Investment	0.334	1.826	0.075
Marketing	0.196	0.843	0.404
Labour Size	0.051	0.346	0.731

H1 – There is a significant relationship between age, educational level, and marital status with the profitability of fish farming.

From the statistical analysis results, Age does not affect the profitability of the fish operators. The result indicates profitability is not influenced by energy and ability to manage the venture due to their old age. Educational level does not represent the profitability of the fish operators. There is no significant difference between educated operators and less educated operators. Marital status has a positive but not significant relationship with profitability. The results of the study are contradictory with Shawon et al. (2018) and Oluwasola and Ige (2015) on the significance of age and size of family, particularly medium size, to financial profitability.

H2 – There is a significant relationship between the number of cages, capital investments, marketing, and labour size with the profitability of fish farming.

The number of cages owned has no significant relationship with profitability. Capital investments indicate no significant relationship with profitability. Marketing has no significant relationship with profitability. Labour size has no significant relationship with profitability. The results of the study are not in line with Oluwasola and Ige (2015), Iliyasu et al. (2016a), and Singh (2007) who stated that the number of cages and hired labours had positive and significant impacts on the fish production which affected profitability. The findings are also not in line with Njeru (2013) and Njagi et al. (2013) who stated that the marketing of fish and capital (Asmah, 2008; Maina et al., 2014; Samah et al., 2016) had a positive impact on fish profitability.

CONCLUDING THOUGHT

There are a few drawbacks and limitations associated with this study which may affect the results. The findings of the study were limited to the population of fish operators in Temerloh, Pahang, Malaysia where the data was collected from 2019 to 2020, during Covid 19's Movement Control Order period. Hence, the findings cannot be generalised. The findings indicate non-significant relationships among age, educational level, and marital status. It is recommended to conduct further studies on other determinants of fish farming profitability which might affect the profit such as water management, family size, knowledge, experience, extension training, government subsidies, technological adaptation, and feed and seed cost. Future research should focus on a broader sample from across the country within an integrated framework to yield more refined results.

In this paper, the results serve as the baseline data for other studies regarding fish farming in other areas in Malaysia such as Terengganu, Perak, and Kelantan. The results contribute to the literature domain and enhances the understanding of particular factors that increase profitability in fish farming in the Malaysian context.
From the perspective of consumerism, adequate understanding of the discussed factors can assist in estimating fish products and identifying appropriate marketing procedures to reach more buyers and make profits. The findings are significant for the fish farmers, fish consumers and government in terms of allocating funds to fish framers, training labours, and offering places for marketing and supplying fresh fish for consumers. The suggestions can increase work opportunities and satisfy consumers' demand which can contribute to the country's economy. A sustainable urban agriculture platform emphasizing the economic burdens of low- and middle-income household-consumer (e.g. Shariff & Osman, 2020) and retires among female-consumer (e.g. Juen & Sabri, 2016) are among the potential future studies in fish farmers' socio-economic factors.

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